Jan. 30, 1940. A. JOSEPHSON 2,188,685

DELAYED ACTION SWITCH

Filed June 14, 1939

Fig. 1.

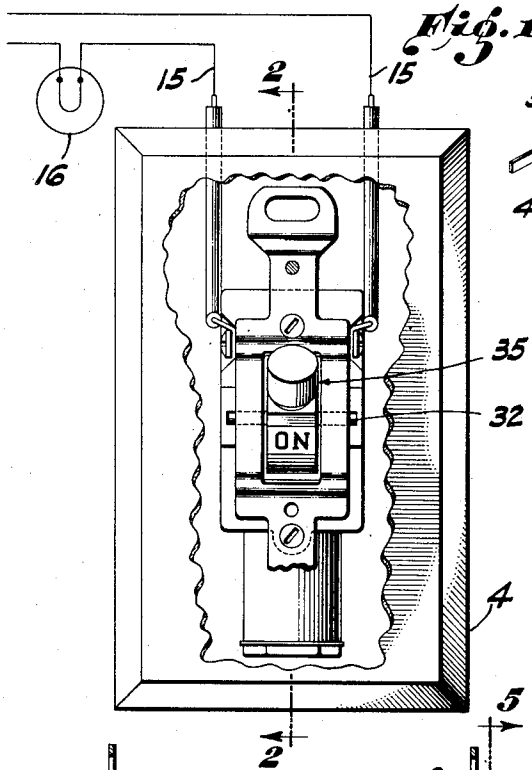


Fig. 7.

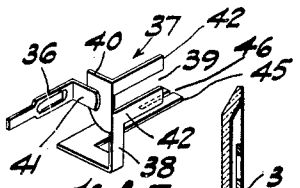


Fig. 2.

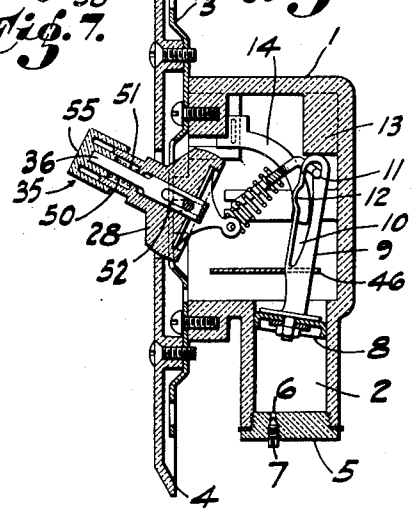


Fig. 3.

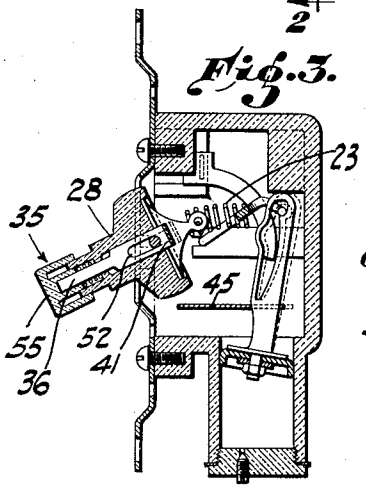


Fig. 4.

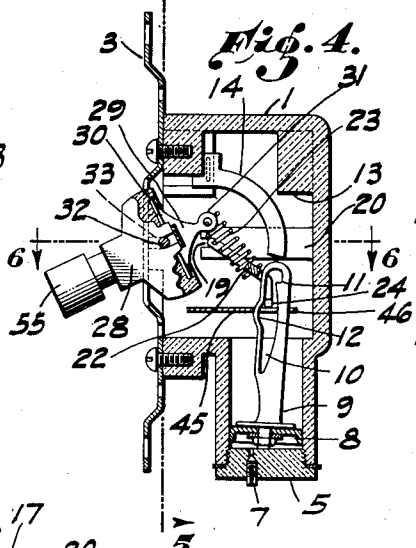


Fig. 5.

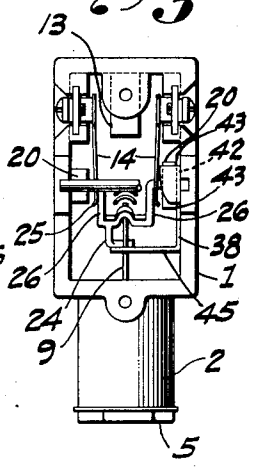
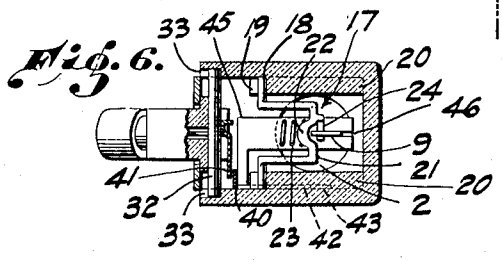


Fig. 6.



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DELAYED ACTION SWITCH

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9 Claims. (Cl. 200—34)

The present invention relates to improvements in switches and particularly to an electric switch having a delayed action.

One of the important objects of the invention is to provide, in a device of the above character, improved means for causing a delayed action in the switch at the time it is turned off.

Another important object of the invention is to provide improved means for instantly opening the circuit switch whenever the delayed action is put into effect.

Still another object of the invention is to provide, in a device of the character stated, an improved combination toggle acting and cooperating push button type of switch.

Yet another object of the invention is to provide in a delayed action switch improved means for assuring a more positive functioning of the switch's delay action mechanism, thereby providing an important additional safety feature.

Still further objects, features, and advantages of invention will hereinafter appear.

In the drawing showing a preferred embodiment of the invention—

Fig. 1 is an elevation, partly in section, showing a face view of the device, with the mechanism in the "on" position. A lamp and wiring for the lamp is included in the view.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a section similar to Fig. 2 showing the delay action mechanism placed in position for starting its functioning.

Fig. 4 is a view similar to Fig. 3 showing the delay action mechanism at the completion of its stroke.

Fig. 5 is a view taken in the direction in which the arrows 5—5 point in Fig. 4,

Fig. 6 is a section taken on line 6—6 of Fig. 4, and

Fig. 7 is a perspective view of a portion of the instantaneous disengaging mechanism.

Referring in detail to the drawing, therein is shown a switch box 1, including a piston chamber 2, a face plate 3 for enclosing the box, and a conventional wall plate 4 attached to said face plate.

A head 5 is screwed into the outer end of the piston chamber, and through said head leads an opening 6 into which is screwed the valve screw 7.

A piston 8 operates in the chamber 2. Said piston is provided with a stem 9 having a cam slot 10, at one end of which there is a cut out, offset seat 11. The stem 9 is also provided with an external cam face 12, and the travel of the piston and stem is limited in their upward stroke by the stop shoulder or bumper 13.

Opposed, downwardly depending, arcuated contacts 14 are mounted in the side walls of the switch box casing 1 and are each connected by wires 15 to a suitable source of power which, when the circuit is completed through said contacts will energize the lamp 16.

The circuit to the lamp is completed by a switch assembly mounted in the switch box which is arranged to provide an improved on-and-off switch, or a combination on-and-off and delay switch.

The latter mechanism comprises a U-shaped yoke 17, see Fig. 6, provided with extensions 18 which are mounted in trunnion recesses 19 formed in ledges 20 constructed as thickened portions of the side walls of the box casing. The cross wall 21 of the U is inwardly arched at 22 to provide a seat for one end of the spiral spring 23 and clearance for the stem 9, and to said cross wall 21 I fasten a hook 24 to provide an operative connection between the yoke 17 and stem 9. The free ends 25 of each of the contacts 14, which are somewhat resilient, are slightly out-turned to provide easy access of the contact surfaces 26 of the yoke therebetween when the yoke is operated from an inoperative open circuit relation, as shown in Fig. 4, to an operative closed circuit relation as shown in Fig. 2.

In Fig. 5 the inner faces of the contacts 14 are slightly inclined toward each other. Such a mounting insures a firm grip at all times of the contacts upon the contact surfaces 26 of the yoke in their sweeping action thereacross.

The switch assembly further includes a toggle switch lever 28, and means comprising a spring hanger 29 mounted in the slot 30 in the toggle and provided with a seat 31 on which to mount the other end of the spring 23, thus bringing the latter spring and switch toggle into an operative relation with one another.

The toggle 28 is mounted on an axle 32, and the ends of the axle are supported in slots 33, Fig. 6, formed in the front wall of the casing 1.

When the lever 28 shown in Fig. 4 is moved to the position shown in Fig. 2, the circuit to the lamp 16 will be closed. As the spring 23 exerts a lift on the part 22 of the yoke, thus bringing its contacting surfaces 26 into registry with the contacts 14, the hook 24 elevates the piston and stem to the position shown in this view.

When the lever 28 is depressed to the position shown in Fig. 3, the spring 23 exerts a "knee action" pressure on the part 22 causing the hook

24 to exert pressure on the seat 11 through the medium of compression stored up in the spring 23 to cause the piston and stem to start moving downward against the retarding action of the air in the piston chamber. At about the completion of the piston's downward stroke, the torque action of the spring 23 on the yoke unseats the hook 24 from the seat 11. As an added safety feature other means presently to be described have also been provided to accomplish the same purpose.

If during the period of the delayed action brought about by the retarding effect of the expulsion of the air from the chamber 2, it is desired to momentarily disconnect the yoke with its contacts, other mechanism is provided for instantly doing this.

Such mechanism comprises a push button 35 mounted to reciprocate axially within an opening in the lever 28 and having a part 36 operatively related with a disengager 37 for unseating the hook from its seat while the delayed action mechanism is operating.

The disengager 37 is shown per se in Fig. 7 and with its operative parts in Figs. 5 and 6. It comprises a vertically extending part 38 provided with a bifurcation 39 and a laterally extending wing 40 against which the arcuated face of deflected tongue 41 of the part 36 abuts. The limbs 42 forming the bifurcation constitute runners which travel in guideways 43 formed in the right-hand ledge 20 shown in Fig. 5.

The disengager also has a horizontally extending part 45 which depends from the limb 38, and in the part 45 is formed a guide slot 46 in which the stem 9 travels. Exerting manual pressure on the button 35 will cause the part 36 to force the part 45 forwardly thus unseating the hook 24 from its seat 11.

There is formed a cavity 50 in the toggle 28 to provide a seat for the spring 51 to keep the button 35 retracted. The part 36 is provided with a slot 52 through which the axle 32 extends to permit the button 35 to be depressed thus compressing the spring 51 and causing the tongue 41 to move forwardly to actuate the disengager. Said disengager when so operated will move the stem from full line position as shown in Fig. 3 to dotted line position when it is desired to momentarily de-actuate the switch without waiting for its disruption brought about by the delayed action of stem and piston.

Piston 8 has an air tight relation to the chamber 2. Chamber 2 is closed with the exception of the restricted opening 6 containing the valve screw 7. The latter screw governs the amount of air which is being forced through the opening by the downward movement of the piston. The size of the opening determines the timing of the delay.

Button 35 is provided with a shield 55 which encircles the top of the toggle 28. The purpose of this type of button is to insure that no water or electrical conductor can sweep through from wet hands to the spring 51 which would cause the user to get an electrical shock.

The piston 8 comprises a cup shaped, somewhat resilient washer whereby on the upward stroke, as shown in the drawing, air is permitted to pass into the chamber and on the down stroke compression of the air in the chamber on account of the restricted air valve causes the washer to expand in close fit and make a seal along the cylinder wall.

Obviously, the semi-elastic structure of the washer permits a lateral swinging of the piston stem when the cam 12 contacts the disengager, the disengager contacts the stem, or the hook 24 contacts the stem.

Operation

The cycle of operation of the apparatus will start with the toggle 28 when it is in the off position with the light out as shown in Fig. 4. Upon pushing the toggle up, as shown in Fig. 2, spring 23 becomes off center, which, in turn, causes yoke 17 to fly up between contacts 14. This movement completes the circuit to energize the lamp 16, and said lamp will remain energized as long as the toggle 28 is permitted to remain in the position stated.

In order to operate the delay feature, it will be necessary to move the toggle from the position shown in Fig. 2 to the position shown in Fig. 3. This delayed operation prevents yoke 17 from breaking the electrical circuit instantaneously; inasmuch as the operation of the piston 8, which is working against air in the chamber 2, retards the instantaneous action of the yoke. If the piston did not retard the yoke, the light 16 would go out instantaneously. So long as the hook 24 remains in the seat 11 of the piston stem, piston 8 will be forced downward unless displaced by some outside force, such outside force being manual pressure applied to the button 35.

During the downward movement of the piston 8, yoke 17 (being pushed by spring 23, which is always in compression) rides downward between contacts 14 until the torque action of the spring as stated unseats the hook 24 from its seat 11. However, as a safety feature when cam 12 on the front edge of the piston stem reaches the part 45 of the disengager said cam acts against the crotch of the slot 46 to push the stem 9 backwardly, thereby forcing hook 24 from its seat 11. This freedom of the hook permits yoke 17 to move freely downwardly in slot 10. Yoke 17 snaps off contacts 14 breaking electrical circuit and eliminating any tendency to arc.

During the period in which the piston 8 is traveling downwardly, if button 35 is pushed in, it will, in turn, force the disengager 37, forward against the front edge of the piston stem forcing the latter backwardly, thereby disengaging hook 24 from its seat. Upon completion of this operation the hook is permitted to fly down also thus breaking electrical contact with contacts 14. This operation causes the delayed action manipulation to be discontinued immediately, thereby causing instantaneous de-energization of lamp 16. During the forward movement of the disengager 37, its runners 42 ride in the guide ways or tracks 43 formed as an integral part of the casing.

Button 35 automatically releases itself from its operation because of spring 51 which restores it to normal position. Button 35 only operates when the toggle is in the position shown in Fig. 3.

The cycle of the switch action has been described with the chamber 2 in the down position. Obviously the switch may be installed in the conduit box with the cylinder either in a downwardly extending or an upright position.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the subject matter claimed.

What is claimed is:

1. In an electric switch construction, a support, a retarding piston mounted upon said support and including a piston head and a piston rod provided with a shoulder which is directed away from said head, a swingable member supported upon said mounting means, during the circuit opening movement of the switch, said member being retardable by reason of a portion thereof engaging said shoulder, a compression spring operatively related to said swingable member, a manually rockable switch including a spring hanger mounted upon said support, one end portion of said spring being anchored to said hanger whereby the rocking of said switch in one direction causes said swingable member to be pressed by said spring against said shoulder to cause a retarded opening of the circuit, and manually operable means extending through said switch to disengage said swingable member from said shoulder to cause an immediate opening of the circuit before said piston has reached the limit of its retarding movement.

2. In an electric switch construction, a switch box including a top wall, a bottom wall, side walls, and a back wall, a face plate forming a front wall for said box, and a wall plate fastened to said face plate, a switch lever having a manually accessible part extending through concentric openings formed in each of said plates, means rockably mounting said lever upon said box, oppositely disposed arcuately depending contacts mounted upon said box at opposite sides of said switch lever, said side walls having thickened portions, a U-shaped yoke having its side limbs deflected and mounted in trunnions, bearings for which are provided by said thickened wall portions, said yoke being operable to swing from an open to a closed relation to said contacts, yieldable means operatively relating said switch and said yoke whereby when said switch is rocked in one direction the outer edges of the sides of said U are caused to engage the inner faces of said contacts, and when said switch is in the opposite direction said sides of the U are caused to snap out of their engagement with said contacts, means to retard the movement of said yoke in said opposite direction, said means comprising a cylinder provided with an air relief valve and having one end opening into said bottom wall, a piston mounted in said cylinder, a stem for said piston, said stem extending upwardly through said cylinder opening into said box, there being a slot in said piston a side edge portion of which is constructed to form a seat, connecting means to operatively relate said yoke and piston stem whereby when said switch lever is rocked to operatively relate said yoke and contacts said piston will operate in the open direction of said cylinder, and when said switch is rocked in the opposite direction said connecting means will engage said seat to force said piston in the opposite direction to expel air from said cylinder through said valve, said yieldable means at a predetermined period of the pistons stroke in its retarding direction disengaging said connecting means from its seat and in turn said yoke from said contacts.

3. The subject matter of claim 2 and, said piston stem having a cam along an outer edge portion thereof, and means mounted in said box and engageable with said cam to cause a quick deseating of said connecting means from said seat.

4. In a switch construction of the kind described, a casing, a pivotally supported lever projecting through a wall portion of said casing and having outside the casing a manually accessible part whereby it may be rocked, a spring hanger extending from said lever into said casing, a yoke having arms pivotally supported to said casing, the manual rocking of said lever causing it to travel across the space between the pivotal supports of said yoke, a compression spring having one end attached to said spring hanger the free end portion of said yoke having a cross limb provided with a seat for the opposite end of said spring, a pair of contacts positioned to cooperate with said yoke to open and close the circuit, a retarding piston operatively connected with said yoke, said piston having a head and a rod furnished with a shoulder directed away from said head, said shoulder being engageable with said yoke to retard the swinging movement of the latter under the urge of said spring, a shiftable guide for said piston rod, and means to manually shift said guide to cause said shoulder to disengage said yoke thereby to cause an opening of the circuit before said piston has reached the limit of its retarding movement.

5. A retarding device for a switch mechanism of the kind described consisting of a piston-cylinder having a restricted air outlet, an upstanding piston rod provided with a head having a working fit in said cylinder, said piston rod consisting of an elongated plate having a longitudinal slot furnished in its upper portion with an offset seat or shoulder, a pair of contacts forming part of an electric circuit, a movable manually operable switch assembly to electrically open and close the gap between said contacts, a spring connected with said assembly to urge it toward the circuit opening position, said assembly having a part engageable with said shoulder of said piston rod to retard the circuit opening movement of said assembly during the opposition of said piston thereto, a disengager plate having a guide slot through which said piston rod reciprocates, said piston rod having an external cam portion to engage an end portion of said guide slot as said piston approaches the downward limit of its travel thereby to swing said piston rod and disengage said shoulder of said slot from said switch assembly and suddenly open the circuit.

6. The subject matter of claim 5 and, means to manually move said disengager plate to disengage said slot shoulder from said switch assembly at times previous to the automatically retarded opening of the circuit.

7. A retarding device for a switch mechanism of the kind described consisting of a piston cylinder having a restricted air outlet, an upstanding piston rod provided with a head having a working fit in said cylinder, said piston rod consisting of an elongated plate having a longitudinal slot furnished in its upper portion with an offset seat or shoulder, a pair of contacts forming part of an electric circuit, a movable manually operable switch assembly to electrically open and close the gap between said contacts, a spring connected with said assembly to urge it toward the circuit opening position, said assembly having a part engageable with said shoulder of said piston rod to retard the circuit opening movement of said assembly during the opposition of said piston thereto, a disengager plate having a guide slot through which said piston rod reciprocates, said disengager plate also having arms which extend parallel to its said guide slot, casing portions through which said arms extend to guide the

movements of said disengager plate, a wing extending angularly from said arms, and manually operable means to engage said wing to move said disengager plate in a direction to disengage said slot shoulder from said switch assembly to open the circuit.

8. The subject matter of claim 7 and, said piston head comprising a cup-shaped washer thereabout which permits said slot shoulder engaging part to restore said disengager to its normal position.

9. The combination with a switch mechanism including a casing and a manually operable lever swingably mounted on said casing in an outwardly projecting relation thereto, said lever having a passage extending longitudinally through it; of a part within said passage and slidable longitudinally therealong, a push button carried by the outer end portion of said part and affording a means for manually sliding it inwardly, said push button being furnished with a sleeve having a working fit around the outer end portion of said lever to guard against entrance thereinto of matter apt to cause a short circuit, a spring positioned to restore said button and part to extended positions, and means operatively connected with the interior portion of said part to affect the action of the circuit opening and closing means of the switch.

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